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**ADDENDUM TO THE REMEDIAL INVESTIGATION  
VOLUMES I - IV  
NL INDUSTRIES, INC. SUPERFUND SITE  
PEDRICKTOWN, NEW JERSEY**

**Introduction**

The U.S. Environmental Protection Agency (EPA) has prepared this addendum to the Remedial Investigation (RI) report and its Appendices for the NL Industries, Inc. (NL) Superfund Site located in Pedricktown, New Jersey. The RI report was prepared by O'Brien & Gere Engineers, Inc. (OBG) for NL, a Potentially Responsible Party for the site.

This addendum report serves as a companion document to the EPA approved RI Report. This document addresses several issues which EPA has determined need further discussion and/or clarification. In addition, this Addendum documents conclusions arrived at by EPA through review of the RI data, which have not been reached by OBG. The issues mentioned above are discussed in the following paragraphs and are organized according to RI Volume and topic.

**VOLUMES I and II (OCTOBER 1990)**

**Executive Summary and Introduction**

Subsequent investigation indicates that there are approximately 10,000 cubic yards of lead-bearing materials located on site in battery bins and other areas.

Some statements contain inaccuracies. It should be noted that Table 22 indicates that sediment concentrations in the West Stream ranged from 8.6 mg/kg to 59,700 mg/kg of lead, not 171 mg/kg to 23,700 mg/kg as stated. In this case at location WS-11, the higher concentration was at the 3-6 inch depth, not 0-3 inch depth (Table 10-1). Table 22 also indicates an upper range of 4350 mg/kg of lead for the East Stream, not 628 mg/kg as stated in the text.

The site is 44 acres, not 68 acres.

Barometric pressure changes will only affect water levels in confined aquifers.

**Study Area Investigation**

The photographs referenced in this section and presented in Exhibit G have not been documented and serve no purpose in this report.

Assertions that the rail trains crossing through the site influences changes in water elevation are unsupported.

The potential significance of the underground fuel storage tanks and underground septic tank to overall site remediation has not been adequately addressed. The presence of these structures may impact remediation in the manufacturing area. These structures might also be related to the low level organic contamination detected on site. The FS will address the final closure and remediation of these structures.

#### **Surface Water and Sediments**

The East Stream feeds into another stream, which runs along a dirt road on the military installation, prior to joining the West stream.

The RI states that the background concentrations are based on sediment samples numbers 401, WS-12 and WS-13 (Figure 5). These are inappropriate locations for "background" samples, since they were obviously impacted by the site. For example, WS-13 is highly contaminated at 1850 ppm of lead.

#### **Surface Soils**

The average off-site soil lead concentration (210 mg/kg) within 500 feet of the property boundary and the maximum detected off-site lead concentration (1770 mg/kg) appear to be relatively high for a mostly rural area. Federal Soil Action Levels for lead are 500 to 1000 mg/kg.

#### **Groundwater and Hydrogeology**

Only a fraction of the available well logs have been provided in the RI. Therefore, EPA could not evaluate the hydrogeologic framework presented in the RI. It is difficult to review the nature and extent of contamination because the report does not provide a clear discussion of how the various uncontrolled areas of waste disposal relate to detected levels of soil and groundwater contamination.

The report concludes that the first and second confined aquifers have not been measurably affected by site activities, based upon results from wells 9R2, 12 and 13. It should be noted that almost all of the data for lead resulting from sampling of these wells was rejected or qualified. Therefore, the conclusion is unsupported.

The suggested correlation between a delayed response to a rainfall event and limited hydraulic correction between the unconfined and first "confined" aquifers is not well supported, since it is based on groundwater evaluation data from only three "deeper" wells. As noted on page 36, the discontinuity of the Upper Clay Member, depicted in cross-sections B-B' and C-C' (see Figures 17 and 18), provides the potential for communication between the two aquifers.

The site hydrogeologic framework has not been clearly defined. The geologic cross-sections do not identify the boundaries between the aquifer units that are discussed in the text (i.e., shallow unconfined, deep unconfined, first confined, etc.). The differentiation of "deep" and "shallow" unconfined aquifer wells does not appear to provide very useful information because in some cases, such as monitor wells NS and ND, the screen intervals are sampling essentially the same interval but the results are being presented on different maps. No criteria are provided for how the unconfined wells have been divided into "shallow" and "deep" as indicated on contaminant maps. What is referred to as the "first unconfined aquifer" may more appropriately be referred to as a "semi-confined" aquifer, because there is no continuous confining layer.

The RI Report suggests that the Middle Clay Member extends across the site and is sufficiently thick that it separates the first and second "confined" aquifers. This is based on borings from only two wells located in the western portion of the property and the "reported" presence on properties located north and east of the site. Despite this inference, downward migration of the contaminants into the second "confined" aquifer may be occurring, as a result of significant groundwater pumping at the BF Goodrich production wells.

It is possible that the volatile organics detected in well SD may originate from the underground fuel tanks and that the elevated TOX level (1.75 mg/l) found in well 11 may reflect leakage from the septic tank.

The conclusions regarding water quality in the first confined aquifer are largely based upon the results of only two wells which are indicated as being screened solely within that aquifer.

#### **Radioactive Isotope Samples**

Exhibit F does not provide any indication that there are naturally occurring radioisotopes at the site. Groundwater analyses from well SD shows that a clear anomaly exists at the site at this location that may be related to on-site activities. These radiation levels may be considered to be site-related, until more information can be provided on site-specific levels of naturally occurring radioactive sediments.

Elevated radiation levels were detected in monitor wells 2R2, KD and especially SD. The resampling of these wells, shown in Appendix V, was supposed to have included all isotopes of Radium, Thorium and Uranium that were included in the original sampling shown in Table 19 of Volume I. However, U-234, Th-230 and Ra-228 were not analyzed during the supplemental sampling. EPA is conducting further investigation to obtain the necessary data.

These results are of limited value without data from the missing isotopes. Inequilibrium exists between the ratio of the isotopes of Ra, Th and U. Because this ratio does not occur naturally, it may be the result of contamination from the site.

#### **Baseline Risk Assessment**

The current land use should include both actual current land use and potential land use (O'Brien & Gere's future land use) exposures. Currently, the land use is industrial. As such, the current exposure pathway on-site is a trespasser scenario. Also under a current land use scenario is the potential for an industrial exposure scenario. A baseline risk assessment assesses potential risks regardless of institutional or engineering controls. All scenarios assessed in the Volume I risk assessment belong under current land use.

The argument presented concerning the "unreasonable assumption that industrial use would be implemented at the site in the absence of site remediation" represents an incorrect interpretation of the risk assessment guidance.

Although changes to the risk assessment are presented separately in Volume IV, Appendix W, the revisions are still part of the baseline risk assessment. Hence, not only are the changes consistent with the baseline risk assessment, they are part of the baseline risk assessment document.

It is inappropriate for the writer to present editorial comments regarding opinions or interpretation of the risk assessment procedures and methodology. These comments should be ignored. They include:

Pg. 58, second paragraph,  
Pg. 92, third paragraph,  
Pg. 88, first sentence,  
Pg. 89, third sentence,  
Pg. 90, third sentence,  
Pg. 91, second paragraph, fifth sentence,  
Pg. 92, fourth sentence,  
Pg. 106 & 107, second paragraph, fourth, fifth and sixth sentences, and  
Pg. 108, third paragraph, third sentence.

Site-specific uncertainties that surround the risk assessment should have been presented in the uncertainty section of the risk characterization.

## **Contaminant Fate and Transport**

The influence of complexing on arsenic mobility applies only to aqueous systems.

It is not necessarily true that the petroleum based organics detected in groundwater will biodegrade in the near future. Biodegradation can be highly sensitive to site-specific physical/chemical conditions, including groundwater pH and redox conditions.

The biodegradation of chlorinated ethenes is generally slow particularly under anaerobic conditions and sensitive to site-specific conditions.

Organic complexing often increases rather than decreases the mobility of metals.

There is a possibility of leaching radioactive constituents from native soils by the acidic site groundwaters.

It is noted that according the revised NCP, the acceptable risk range is  $10E-4$  to  $10E-6$ , not  $10E-7$  as stated in the RI.

OSWER Directive #9355.4-02 lists soil lead cleanup levels from 500 to 1000 ppm at Superfund Sites. In addition, the current groundwater action level for lead is 15 ppb.

## **VOLUME III (December, 1990): APPENDICES R-U**

The only attempt at delineating the various habitats is in Appendix S (Ecological Assessment), and this does not always agree with the large-scale wetland delineation map. Plant community classifications should have been used on the delineation maps or in the narrative text to identify positively the actual various wetland types to be found on the site.

The assessment is strictly a qualitative evaluation of potential impacts to the ecological communities, as a result of site-related lead contamination. It is not a quantitative evaluation.

In Section 2.06.01, it is noted that if effects to freshwater organisms are greater than those associated with marine and estuarine organisms, "biological effects levels" designed to be protective of marine and estuarine organisms would not be "conservative indicators of freshwater impacts," as is stated in the RI. The RI did not justify the use of the (300 mg/kg of lead AET value rather than the Effects Range-Low (ER-L) 35 ppm or the Effects Range-Medium (ER-M) 110 ppm value discussed in this

section. Based on the National Oceanographic and Atmospheric Administration (NOAA) guidance cited in the report, the ER-M value is most appropriate.

Appendix S, the Ecological Assessment, includes, in Section 3.03, a cover-type analysis that is not consistent with the information presented in Appendix R. While the Elm-Ash-Red Maple Forest is described as "included in the area delineated as a wetland," the Mixed Deciduous Forest is not so described. However, much of the latter area, as shown in Figure S-2, is delineated on the wetland maps as wetland, and includes red maple and other wetland species. Phragmites, a reed, is listed as a common tree species in the Elm-Ash-Red Maple cover type, but Elm is not listed. Further, these cover types do not adequately reflect the actual species makeup of the vegetation associations encountered onsite. The Cultivated Field cover type is discussed only briefly, with no discussion of the crops that are grown in or adjacent to the study area. There is no discussion of whether these are environmentally significant agricultural lands.

With regard to Section 3.03.02 (Terrestrial Wildlife Resources), is inappropriate to substitute lists of typical species for on-site sampling or observation at appropriate seasons. Also, in Table III, a number of the scientific names of species are opposite the wrong common name. The genus in the scientific name should not be abbreviated. Table IV gives an unrealistic idea of what might be found in this particular geographic area. During an EPA site visit, a white-tailed deer (Odocoileus virginianus) was observed on site and this mammal is not listed in Table IV.

With regard to Section 3.03.03 (Aquatic Wildlife), the assumption that the stream area contiguous to the site is not a viable fish habitat is unjustified. Even though surface flow may cease or be reduced, this does not mean that the stream is unused. The assumption is not supported by data or by referencing the location of data to support it. In addition, amphibians and reptiles using these areas should also be considered aquatic wildlife.

General statements such as "there were no effects to the ecology potentially attributable to site residues..." in Section 3.04 are not supported by information such as: the types of effects that were investigated, the level of effort expended in investigation, and the areas that were surveyed during the investigation.

In Section 4.01, examination of the data for metals other than lead in stream sediment samples suggests that elevated levels of antimony, arsenic, cadmium, copper, and zinc may be of environmental concern. Although a relationship may exist between elevated levels of these metals and elevated lead levels in sediments, it is inappropriate to disregard the significance of other inorganics as they relate to the overall effect on the environmental receptors under consideration. The above listed

metals are contaminants of concern and their potential impact on aquatic and benthic organisms must be considered.

Section 5 deals with exposure of receptors. While it is true that no federal endangered species are known to inhabit the site itself, there is every reason to suppose that overwintering Bald Eagles and other birds of prey could use the site for hunting, and thereby consume prey animals that have been exposed to contaminants.

#### **VOLUME IV (MARCH 1991): APPENDICES V-W**

Table V-1: The 1989 and 1990 lead data in soils generally appear to support previous site characterization data indicating that maximum soil lead concentrations generally occur in the top six inches of soil. The 1989-1990 data do not indicate evidence of lead concentrations of greater than 1000 ppm (mg/kg) below 18 inches in depth. Concentrations in excess of 100 ppm are, however, noted in several samples at depths of 12 inches or greater, including on-site samples from locations #123 and #217.

Table V-2: The 1989 and 1990 soil lead data for off-site sampling locations #44 and #44A are generally consistent with 1988 off-site results. The results for location #44 do, however, indicate that lead concentrations of 160 ppm were detected at a depth of 6-12 inches. Table V-2 and Figure V-3 show surface soil contamination exceeding NJ Soil Action Levels adjacent to the East Stream.

Table V-3: When compared to NJ Soil Action Levels, the data show that several stream sediment locations exceed the levels for some or all of the following: antimony, arsenic, cadmium, chromium, lead and zinc. These locations are EPA 1-7, 9, 11, 13 and WS 8, 9, 11, 15, and 16. It is clear that stream contamination has extended beyond the site boundaries and downstream towards the Delaware River.

Samples EPA-13 and WS-11 which showed high lead levels (>20,000 ppm) also showed elevated levels of antimony (1,300 ppm), arsenic (235 ppm) and copper (131 ppm). Also, certain samples such as EPA-5 (0-6 inches) which displayed only moderate lead levels (643 ppm) did display relatively high levels of chromium (559 ppm) and zinc (1,340 ppm).

Table V-5, Groundwater Quality Lead Data results from 1989 indicate that lead was measured in wells HS and KS in the plant area in excess of one ppm in filtered groundwater.

The 1989 and 1990 results continue to indicate widespread acidic groundwater result with pH levels less than pH 4.5 at a number of locations including wells 3R, 4R, 5R, 13, 18, BR, KD, KS, etc. Extremely acidic pH levels of less than pH 3.0 were reported for several wells. These pH levels may have the potential to dissolve

selectively some metals including iron from soil into solution, depending upon the native soil chemistry.

It should be noted that total organic halides (TOX) remain elevated (1.75 ppm) at MW-11, suggesting possible organic contamination.

Three additional wells were installed in the first confined aquifer and one in the second confined aquifer. As presented in Table V-6, the following well samples exceeded MCLs for arsenic, cadmium or lead: 2R2, 4R, 7, 10, 11, BR, HS, JD, KD, KS, MS, SD, and SS. The data indicate that groundwater around the landfill exceeds MCLs. Specifically, well 2R2 consistently exceeds the MCL for arsenic. Both deep and shallow wells indicate that the groundwater has been impacted by the site.

The 1989 radioactivity detections of gross alpha and gross beta at well SD are also the location at which high cadmium and chromium concentrations were observed. This might suggest a discrete depositional source.

Table V-12 - The results of volatile organic analyses confirm the presence of several VOCs including 1,1,1-trichloroethane (2.5 ppm), 1,1-dichloroethene (0.2 ppm) and tetrachloroethene (0.2 ppm). These VOCs might be related to solvents disposed into the septic system.

Regarding Figure V-1 entitled "Stream Sediment Lead Concentrations," the East and West Streams (middle and bottom lines, respectively) flow from right to left, as this figure is drawn. They merge at their intersection, and continue as one, until they reach the Delaware River (top line). The plant area is located between Pedricktown Road and the railroad tracks, between the East and West Streams. Thus, this area has the highest lead concentrations, especially in the West Stream.